SB761
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R2-74-11

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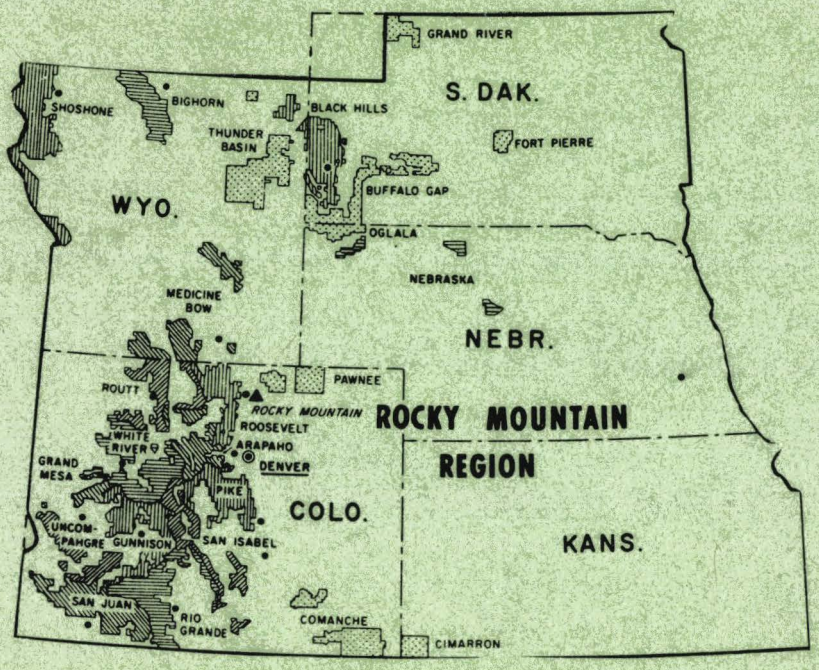
BIOLOGICAL EVALUATION

MORTALITY AND TOP-KILL OF PLANTED PONDEROSA PINE

Grand Mesa-Uncompahgre National Forest
Miguel District

August 1974



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BIOLOGICAL EVALUATION

Mortality and Top-Kill of Planted Ponderosa Pine

Grand Mesa-Uncompahgre National Forest
Miguel District

August 1974

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BIOLOGICAL EVALUATION

MORTALITY AND TOP-KILL OF PLANTED PONDEROSA PINE

Grand Mesa-Uncompahgre National Forest
Miguel District

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INTRODUCTION

Tree mortality and top-kill have been frequently reported in young ponderosa pine (Pinus ponderosa Laws) plantations of the Miguel Ranger District. Usually this injury was attributed to the North American porcupine (Erethizon dorsatum L.) The intensity and frequency of damage has generated concern for the future of these forest lands because of the high initial investment in site preparation and planting. In order to assess the true causal agent and extent of injury, a survey was conducted by Tom Landis, pathologist, in selected pine plantations on the District.

Because this damage was most apparent on trees of large seedling or sapling size, this survey was restricted to plantations containing trees of these classes. The planting records of the Miguel District were consulted and eight pine plantations were selected for evaluation. On the ground surveys revealed that several plantings were unsuccessful and so the number of suitable sites was reduced to five.

The sampling procedure consisted of a systematic pattern of points, established so that all portions of the plantation would be sampled. Each sample point served as the axis for two perpendicular lines, dividing the sampling site into four equal quadrants. The tree nearest the sample point in each quadrant was inspected for injury, yielding a total sample of four trees per point. The distance between sample points was established by pacing a set distance, usually five to ten chains, depending on the acreage involved.

Each sample tree was rated for either presence or absence of significant injury and the probable agent was identified. The severity of injury was rated as either significant injury, specifically deformity or mortality, or non-significant injury. Any injury not considered to be limiting to tree production was rated as non-significant. Mortality was so rated whereas injury that would adversely affect the form of the tree was listed as deformity. The number of years of height growth lost due to the injury was also measured.

RESULTS AND DISCUSSION

One overall impression gained from this evaluation was the high variability in the proportion of trees damaged between plantations. (Table 1). These young pine plantations exhibited injury levels ranging from less than 40% to over 80%. While some of this injury was of a minor degree, many trees showed the type of injury that could consititute an adverse impact on the future production of these plantations (Figure 1.).

The major agent of tree injury was the procupine; in all but one plantation over 95% of the tree damage was attributed to this rodent (Table 1). The exception was the 25 Mesa plantation where only 10% of the tree injury was caused by porcupines; in this case, the most common pest was a tip moth. Old terminal damage and tree mortality was frequently found at 25 Mesa, indicating a severe infestation of tip moth about five years ago. This type of damage was not noticed at any of the other sites. The lack of porcupine activity at 25 Mesa is difficult to explain but could be attributed to unsuitable habitat, high predator populations or lack of an original established population.

The proportion of injuries resulting in mortality averaged 20% for all sites (Table 1). This value represents the cumulative mortality during the last few years, extending as far back as the cause of death could be determined. Although some trees are killed while relatively small, extensive girdling by porcupines can kill trees of considerable size (Figure 1). Loss of these larger trees can constitute a substantial impact on the productivity of the plantation. The threat of porcupine caused mortality exists until the pine achieves larger sapling stages.

Although the probability of mortality decreases in the larger size classes, the possibility of structural deformity exists in all classes. In this survey the amount of deformity ranged as high as 31% which indicates the importance of this type of injury (Table 1).

The feeding activity of porcupines often results in top-kill, either directly through girdling, or indirectly due to secondary mechanical damage after initial weakening of the bole (Figure 2). Severe bole injury may eventually result in mortality but often, in lesser cases, the tree may recover. One of the lateral branches below the girdle may establish dominance and become the leader; in other cases, a forked or multiple top may develop, reducing the merchantability of the individual.

Even if deformity does not result from procupine girdling the tree often suffers a considerable setback in height growth (Figure 3). A quantitative estimate of height loss was made by counting the number of internodes from the terminal to the girdled area, accepting each internode as one year of height growth. The average number of years lost due to bole damage ranged from 2 years at 25 Mesa to six years at the Dave Wood Plantation (Table 1). While this loss in height growth may not seem significant in the entire ontogeny of the tree, a loss of six years may be indeed significant because rapid terminal growth is most desirable in young plantations.

TABLE 1

TYPE AND INTENSITY OF INJURY TO PONDEROSA PINE PLANTATIONS ON THE MIGUEL DISTRICT, UNCOMPAHGRE NATIONAL FOREST

PLANTATION				INCIDENCE OF INJURY			INJURY TYPE AND INTENSITY			
					AGENT		SIGNIFICANT INJURY			NON-SIGNIFICANT INJURY
NAME	LOCATION	SIZE (ACRES)	SAMPLE POINTS (NO.)	INJURED TREES (% of TOTAL)	(TYPE)	(% of TOTAL INJURY)	MORTALITY (%)	DEFORMITY (%)	DEFORMITY HT. LOSS (YRS.)	(%)
Dave Wood	T47N, R10W, Sec. 27	178	172	85	Porcupine Insect Other	98 1 1	23	31	6	46
Sanborn Park	T45N, R12W, Sec. 5	66	88	67	Porcupine Insect Other	97 2 1	17	17	5	66
25 Mesa	T49N, R2E, Sec. 17	183	108	38	Porcupine Insect Other	10 58 32	20	17	2	63
Clay Creek	T45N, R12 W, Sec. 2 T46N, R12W, Sec. 35	642	180	53	Porcupine Insect Other	96 2 2	27	24	3	49
Big Red Canyon	T46N, R12W, Sec. 10,15,17	167	196	71	Porcupine Insect Other	98 1 1	16	28	5	56

Figure 1 Some plantations showed levels of damage that could affect their future production.

Figure 2 Porcupine injury on this pine weakened the bole and predisposed it to mechanical damage.

Figure 3 Porcupine girdling damage may result in a considerable setback in height growth.

RECOMMENDATIONS

Of the many forest pests in the United States the porcupine is one of the most difficult to successfully control. The difficulty lies in locating the rodents rather than their resistance to control techniques. In contrast to other members of the rodent family, the destructive capacity of the porcupine does not depend solely on large populations; one adult can damage many trees in a short period. Therefore, control efforts are usually designed to eliminate small populations over extensive areas.

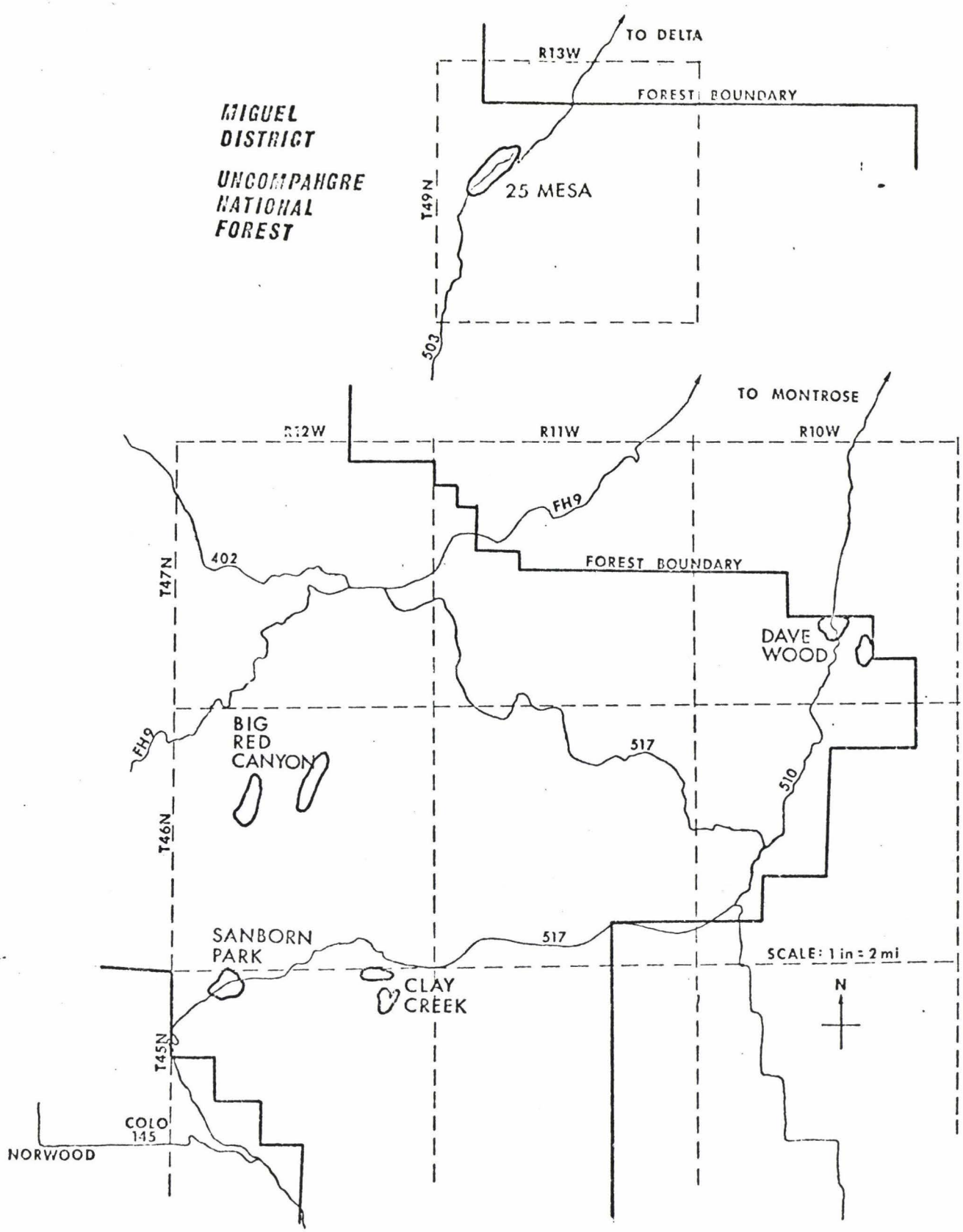
The problem of locating porcupines can be approached either directly, by tracking the animals and eliminating them, or indirectly, by attracting them to a poisoned bait. The former technique, while obviously effective, would require a substantial expenditure of manpower and may be difficult to justify. Porcupine eradication projects are most effective during periods of winter snow cover, however, when there are fewer demands on manpower. Trained personnel using dogs can be very efficient during this time of year, especially if coordinated with other woods activities. A regular program of plantation patrols can substantially reduce the impact of porcupines on these valuable forests.

The other major type of porcupine control consists of poisoning the rodents after attracting them to a bait station. Due to their inherent low population density and restricted activity range, the number and placement of the bait stations is of prime importance. Bait should be placed in areas of high porcupine activity, ideally near burrows or trails; these high activity areas are readily apparent during periods of snow cover.

In this age of environmental concern the use of many rodenticides has been prohibited or restricted. Currently, the only EPA approved poison for porcupines is strychnine-treated salt blocks and these blocks must be mounted in trees to prevent accidental poisoning of other vertebrates. The salted wooden blocks act as an attractant and the fast-acting poison insures rapid kill. Due to the dynamic nature of pesticide registration, it would be advisable to check with local authorities before initiating a control program.

Due to the relatively low fecundity of the porcupine, a well-planned control program, implemented at regular intervals, can substantially reduce the adverse impact of these forest pests in high value forests such as plantations.

During the course of the damage survey the lack of adequate stocking in some areas was readily apparent. In particular, large sections of the Clay Creek, Big Red Canyon and other plantations are almost barren of pine seedlings. Considering the high initial investment in site preparation, it would be economically justifiable to replant these areas. Most of the unstocked land has not yet been reinvaded by competitive vegetation and therefore a replanting program would still benefit from the initial site preparation. A regular program of porcupine control subsequent to replanting would insure its success.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UNCOMPAHGRE
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TO MONTROSE
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R10W
FH9
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NORWOOD